INSTRUCTION MANUAL
DB42 - DB52 - DB62

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Electro Scientific Industries
13900 N.W. SCIENCE PARK DRIVE • PORTLAND, OREGON 97229

BRIDGES
AND
ACCESSORIES

AUGUST 1964

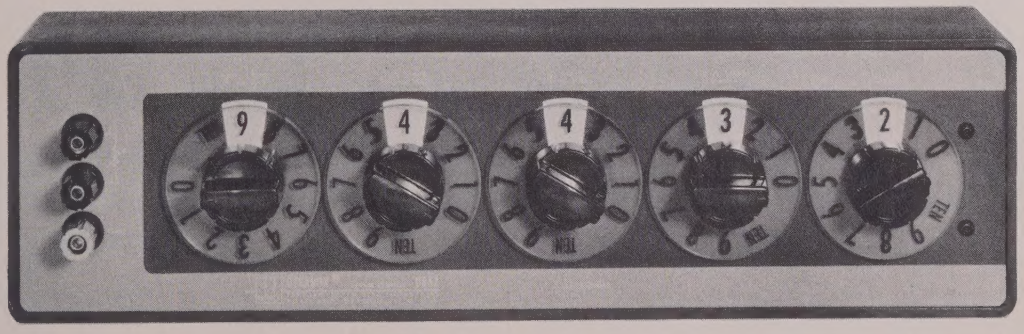
MODELS

DB 42
DB 52 DB 62

Instruction Manual

IN-LINE DEKABOX®

DECADE RESISTORS



SERIAL NUMBER:_____

PART NUMBER: 7275

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WARRANTY

ELECTRO SCIENTIFIC INDUSTRIES, INC. warrants each instrument and component parts to be free from defects in material and workmanship. ELECTRO SCIENTIFIC INDUSTRIES, INC. will service any instrument and replace parts thereof (except tubes, fuses and batteries) which shall, within one year after delivery to the original purchaser, prove to be defective.

A nominal fee will be charged for repairs which are made necessary by misuse or abnormal operation. In this case an estimate will be submitted before the repairs are made.

ELECTRO SCIENTIFIC INDUSTRIES, INC. reserves the right to make changes in design at any time without incurring obligation to modify units previously purchased.

Electro Scientific Industries
13900 N. W. SCIENCE PARK DRIVE, PORTLAND, OREGON 97229

I INTRODUCTION

1.1 Purpose of Equipment

The in-line DEKABOX® decade resistors are adjustable resistors that can be easily set to a resistance value for precision dc and audio frequency use.

1.2 Description

There are three models of Dekabox, Model DB 42 has four resistance decades, Model DB 52 has five, and Model DB 62 has six. Each unit consists of a metal case, three binding posts, and four, five, or six decade resistance switch assemblies. Figure 1-1 shows panel arrangement and dimensions of all models.

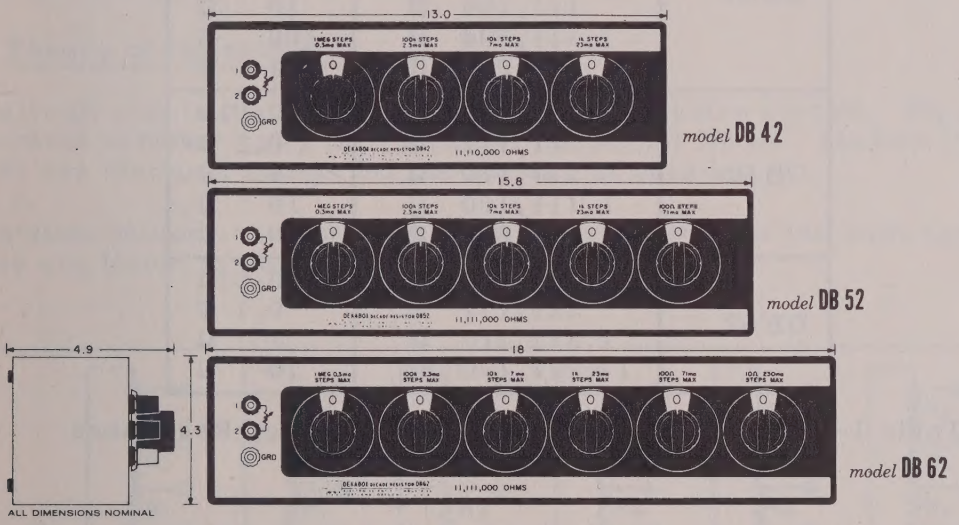

Figure 1-1 Dekabox Outlines

1.3 Specifications

INITIAL ACCURACY OF RESISTANCE CHANGE FROM ZERO SETTING: ±(0.01% + 0.0005 ohm per decade) at 23°C
LONG-TERM STABILITY: ±(0.01% + 0.001 ohm per decade) per year
APPROXIMATE ZERO RESISTANCE: 0.002 ohms per decade
RATING PER RESISTOR: 0.5 watt or 300 volts maximum
TEMPERATURE COEFFICIENT: ±10 ppm/° C 1k steps and above; ±20 ppm/°C below 1k steps
POWER COEFFICIENT: ±0.03%/watt/resistor 1k steps and above; 0.06%/watt/resistor below 1k steps
NUMBER OF DECADES: DB 42, four; DB 52, five; DB 62, six
BREAKDOWN VOLTAGE: 1500 peak volts--sea level
WEIGHT: DB 42, DB 52, DB 62 -- 4 lbs. net. 10 lbs. packed for shipping
MAXIMUM CURRENT PER RESISTOR: Shown in Table 1-1.

1 MEG	100k	10k	1k	100Ω	10Ω	1Ω	0.1Ω	0.01Ω
0.3ma	2.3ma	7ma	23ma	71ma	230ma	710ma	1.6a	4a

Table 1-1 Resistor Current Limits

TOTAL RESISTANCE AND MINIMUM STEP RESISTANCE AVAILABLE: Shown in Table 1-2.

MODEL	TOTAL RESISTANCE	OHMS PER STEP
DB 42	111.1Ω	0.01Ω
	1,111 Ω	0.1 Ω
	11,110 Ω	1 Ω
	111,100 Ω	10 Ω
	1,111,000 Ω	100 Ω
	11,110,000 Ω	1 k
DB 52	1,111.1Ω	0.01Ω
	11,111 Ω	0.1 Ω
	111,110 Ω	1 Ω
	1,111,100 Ω	10 Ω
	11,111,000 Ω	100 Ω
DB 62	11,111.1Ω	0.01Ω
	111,111 Ω	0.1 Ω
	1,111,110 Ω	1 Ω
	11,111,100 Ω	10 Ω

Table 1-2 Total Resistance and Minimum Step Resistance

II OPERATION

2.1 Operating Instructions

Three binding posts are provided for connections on the panel of each Dekabox. The GRD binding post is connected to the metal case which forms a shield for the unit.

The resistance of the unit corresponds to the setting of the in-line dials. The resistance per step of each decade switch is marked above the dial.

Note that switch positions correspond to clock number positions of the bar knobs: 1 is at one o'clock, 2 at two o'clock, and TEN at ten o'clock. This feature allows an operator to set the resistance by feel without looking at the unit.

2.2 Theory of Operation

The circuit consists of resistors switched in a series circuit. Figure 2-1 illustrates schematically the circuit of the Model DB 62. Models DB 42 and 52 are identical except for the number of decades.

Resistance values are related to the total resistance of the unit; these values are listed in Table 2-1.

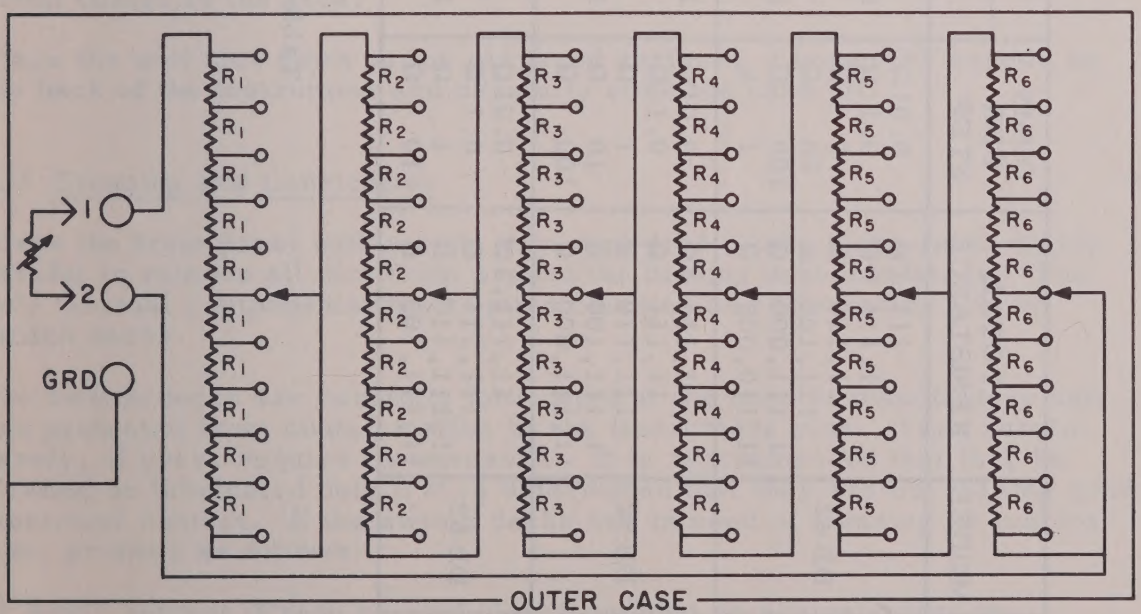

Figure 2-1 Dekabox Schematic Diagram

MODEL	TOTAL RESISTANCE	OHMS PER STEP	RESISTOR VALUES					
			R_1	R_2	R_3	R_4	R_5	R_6
DB 42	111.1Ω	0.01Ω	10Ω	1Ω	0.1Ω	0.01Ω		
	1,111 Ω	0.1 Ω	100Ω	10Ω	1 Ω	0.1 Ω		
	11,110 Ω	1 Ω	1k	100Ω	10 Ω	1 Ω		
	111,100 Ω	10 Ω	10k	1k	100 Ω	10 Ω		
	1,111,000 Ω	100 Ω	100k	10k	1 k	100 Ω		
	11,110,000 Ω	1 k	1 MEG	100k	10 k	1 k		
DB 52	1,111.1Ω	0.01Ω	100Ω	10Ω	1 Ω	0.1 Ω	0.01Ω	
	11,111 Ω	0.1 Ω	1k	100Ω	10 Ω	1 Ω	0.1 Ω	
	111,110 Ω	1 Ω	10k	1k	100 Ω	10 Ω	1 Ω	
	1,111,100 Ω	10 Ω	100k	10k	1 k	100 Ω	10 Ω	
	11,111,000 Ω	100 Ω	1 MEG	100k	10 k	1 k	100 Ω	
DB 62	11,111.1Ω	0.01Ω	1k	100Ω	10 Ω	1 Ω	0.1 Ω	0.01Ω
	111,111 Ω	0.1 Ω	10k	1k	100 Ω	10 Ω	1 Ω	0.1 Ω
	1,111,110 Ω	1 Ω	100k	10k	1 k	100 Ω	10 Ω	1 Ω
	11,111,100 Ω	10 Ω	1 MEG	100k	10 k	1 k	100 Ω	10 Ω

Table 2-1 Resistance Values

III PREVENTIVE MAINTENANCE

The following procedures should be performed periodically (approximately once a year) to insure maximum accuracy and reliability from the Dekabox in-line decade resistors.

If the need for major repairs is apparent, it is recommended that the unit be sent to the factory for service. The service department will be glad to furnish the necessary information for repairs as well as any replacement parts. However, unauthorized repairs will invalidate the instrument warranty. If the instrument is more than one year old when returned to the factory, a reasonable charge may be expected for replacement of parts or complete reconditioning.

3.1 Visual Inspection

Inspect the unit for dial orientation and damage to binding posts and binding post caps. Also check for dirt around the binding post insulators. Then remove the case as described in Paragraph 3.2 and inspect the unit for possible internal defects. These defects include such things as loose or broken connections, damaged or dirty switch contacts, and heat damaged resistors.

3.2 Removing the Case

Prepare a soft, clean place to set the instrument. Be sure that no projections or pointed objects will be underneath the panel. See that there are no metal filings in the area.

Place the unit face down on the prepared surface. Loosen the screws on the back of the instrument and carefully slide the case off.

3.3 Cleaning and Lubrication

Clean the front panel with a soft, dry, lint-free cloth, being particularly careful to remove all dirt from around the binding post insulators. The only internal components that require cleaning and lubrication are the switch decks.

The switch decks are carefully lubricated at the time of manufacture and are protected from contamination by the instrument case. They should rarely, if ever, require maintenance. It is recommended that they be cleaned or lubricated only if it is determined that they are not making good electrical contact. If the switch decks are in need of cleaning or lubrication, proceed as follows:

a) Apply solvent (Freon printed circuit solvent or equivalent) to the contact surfaces with a small brush or pipe cleaner.

b) Wipe surfaces with clean, dry brush or dry with low pressure air.

c) Apply a thin coating of lubricant (Oak #2008 or equivalent) to the contact surfaces with a hypodermic needle.

d) Apply two drops of the same oil to each of the switch bearings and detent mechanisms.

e) Remove excess oil with a clean, dry cloth and remove all traces of lint with a soft brush.

3.4 Replacing the Case

Be sure that the interior of the case is completely clear of all foreign material.

Slip the case over the unit being careful not to touch any resistors with the cover. Replace the screws.

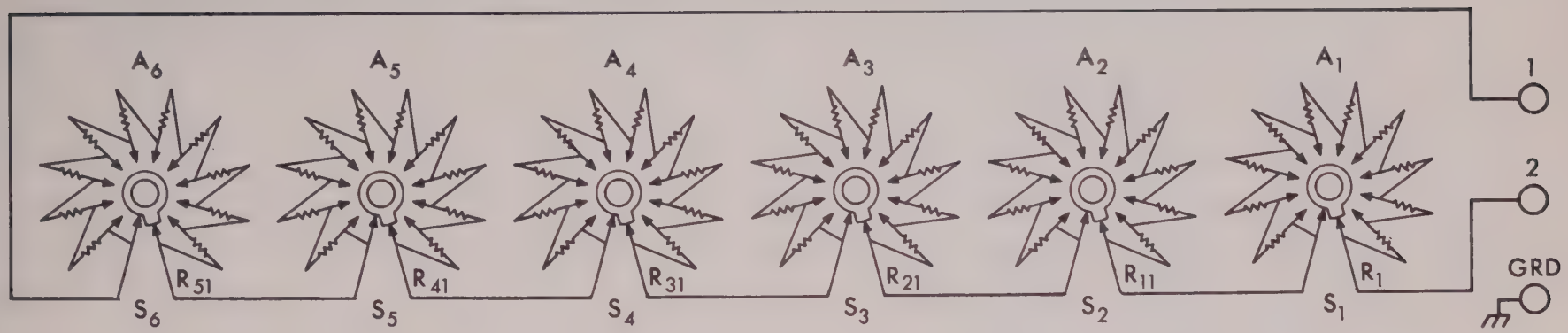

Figure 3-1 Wiring Diagram (DB 62 shown, DB 52 and DB 42 are identical except for A_5 and A_6)

IV PARTS LIST

The following tables list the replacement parts for the several types of Dekabox in-line decade resistors. Resistor switch assemblies vary in the value per step of the resistance. Table 4-1 lists the step resistance and part number of the assemblies in each type of Dekabox; the Dekaboxes are listed by model and total resistance, and the assemblies are listed by reference designation.

Table 4-2 lists replacement parts alphabetically by name of part. All parts listed herein are manufactured by Electro Scientific Industries, and may be ordered from the factory. When ordering parts, include the following information:

Model, serial number, and total resistance of the instrument

Electro Scientific Industries part number

Description of part

Table 4-1 Resistor Switch Assemblies

MODEL	TOTAL RESISTANCE	ASSEMBLY NO.					
		A_1	A_2	A_3	A_4	A_5	A_6
DB 42	111.1	10Ω 7548	1Ω 7549	0.1Ω 7550C	0.01Ω 7591B		
	1,111	100Ω 7547	10Ω 7548	1Ω 7549	0.1Ω 7550C		
	11,110	1k 7546	100Ω 7547	10Ω 7548	1Ω 7549		
	111,100	10k 7545	1k 7546	100Ω 7547	10Ω 7548		
	1,111,000	100k 7544	10k 7545	1k 7546	100Ω 7547		
	11,110,000	1 MEG 7557	100k 7544	10k 7545	1k 7546		
DB 52	1,111.1	100Ω 7547	10Ω 7548	1Ω 7549	0.1Ω 7550C	0.01Ω 7591B	
	11,111	1k 7546	100Ω 7547	10Ω 7548	1Ω 7549	0.1Ω 7550C	
	111,110	10k 7545	1k 7546	100Ω 7547	10Ω 7548	1Ω 7549	
	1,111,100	100k 7544	10k 7545	1k 7546	100Ω 7547	10Ω 7548	
	11,111,000	1MEG 7557	100k 7544	10k 7545	1k 7546	100Ω 7547	
DB 62	11,111.1	1k 7546	100Ω 7547	10Ω 7548	1Ω 7549	0.1Ω 7550C	0.01Ω 7591B
	111,111	10k 7545	1k 7546	100Ω 7547	10Ω 7548	1Ω 7549	0.1Ω 7550C
	1,111,110	100k 7544	10k 7545	1k 7546	100Ω 7547	10Ω 7548	1Ω 7549
	11,111,100	1MEG 7557	100k 7544	10k 7545	1k 7546	100Ω 7547	10Ω 7548

Table 4-2 Parts List

DESCRIPTION	ESI PART NO.	QUANTITY USED		
		DB 42	DB 52	DB 62
Assembly, Resistor switch, 1 Meg per step	7557	*	*	*
Assembly, Resistor switch, 100k per step	7544	*	*	*
Assembly, Resistor switch, 10k per step	7545	*	*	*
Assembly, Resistor switch, 1k per step	7546	*	*	*
Assembly, Resistor switch, 100Ω per step	7547	*	*	*
Assembly, Resistor switch, 10Ω per step	7548	*	*	*
Assembly, Resistor switch, 1Ω per step	7549	*	*	*
Assembly, Resistor switch, 0.1Ω per step	7550C	*	*	*
Assembly, Resistor switch, 0.01Ω per step	7591B	*	*	*
Cap, Binding post, insulated	1170	2	2	2
Cap, Binding post, gold-plated	1172	1	1	1
Dial knob	7524	4	5	6

* One each where used; see Table 4-1.

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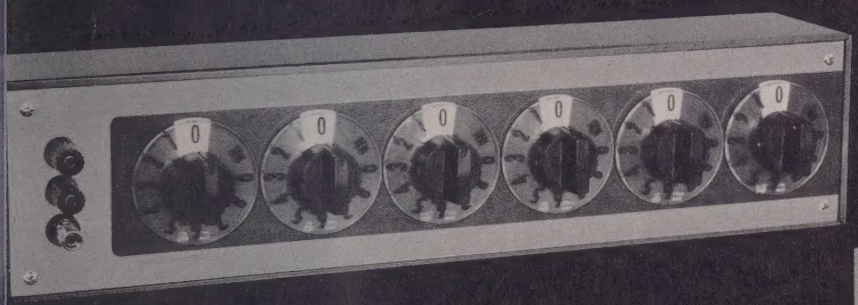
Catalog Sheet

DECADE IMPEDANCE UNITS

C-37

MAY 1964
REPLACES MAY 1963



IN-LINE DEKABOX

DECADE RESISTORS

High Accuracy...Rapid Error-Free Reading

IN-LINE DEKABOX® Decade Resistance Boxes are adjustable resistors, designed for precision dc and audio frequency use. They feature high accuracy, ease of setting and rapid error-free reading. Four, five and six dial units are available. The smallest step provided is 0.01 ohm. The largest total resistance available is slightly greater than eleven megohms.

Initial adjustment precision is maintained by sound electrical and mechanical design and the use of materials of highest stability. Accuracy over a wide range of ambient conditions is assured by using resistors of low temperature and power coefficients. Switches with multiple solid silver alloy contacts provide low, stable contact resistance. Insulation and circuit design minimize leakage effects.

ESI-designed bar knobs rotate the decade switches which point in clock-number directions. Each dial steps its decade from zero through ten times the resistance per step. All dials may be, rotated through 360° to simplify and speed settings. The unused "11" position can be identified by feel because it has no detent stop. These features combine to permit decade setting with a minimum of visual attention.

The DEKABOX® resistance value can be easily read from the large-numeral inline presentation above the knobs. The resistance per step and current rating of each decade are presented below the knobs for operator convenience and circuit protection. A sturdy aluminum housing provides mechanical protection and electrical shielding for the resistance decades.

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Specifications

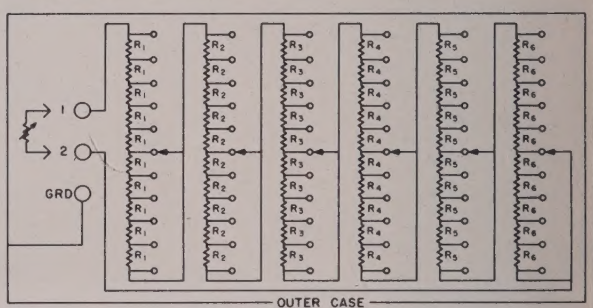
ACCURACY OF RESISTANCE CHANGE FROM ZERO SETTING: ±(0.03% + 0.0005 ohm per decade)
APPROXIMATE ZERO RESISTANCE: 0.002 ohms per decade
RATING PER RESISTOR: 0.5 watt or 300 volts maximum
TEMPERATURE COEFFICIENT: ±10 ppm/°C 1k steps and above; ±20 ppm/°C below 1k steps.
POWER COEFFICIENT: ±0.03%/watt/resistor 1k steps and above; ±0.06%/watt/resistor below 1k steps
NUMBER OF DECADES: DB-42, four; DB-52, five; DB-62, six
BREAKDOWN VOLTAGE: 1500 peak volts—sea level, 25°C
WEIGHT: DB-42, DB-52, DB-62—4 lbs. net. 10 lbs. packed for shipping.

MODEL	PRICE*	TOTAL RESISTANCE	OHMS PER STEP	RESISTOR VALUES R_1	R_2	R_3	R_4	R_5	R_6
DB42	$ 95.00	111.1Ω	0.01Ω	10Ω	1Ω	0.1Ω	0.01Ω		
	$ 95.00	1,111 Ω	0.1 Ω	100Ω	10Ω	1 Ω	0.1 Ω		
	$105.00	11,110 Ω	1 Ω	1k	100Ω	10 Ω	1 Ω		
	$110.00	111,100 Ω	10 Ω	10k	1k	100 Ω	10 Ω		
	$120.00	1,111,000 Ω	100 Ω	100k	10k	1 k	100 Ω		
	$160.00	11,110,000 Ω	1 k	1 MEG	100k	10 k	1 k		
DB52	$120.00	1,111.1Ω	0.01Ω	100Ω	10Ω	1 Ω	0.1 Ω	0.01Ω	
	$120.00	11,111 Ω	0.1 Ω	1k	100Ω	10 Ω	1 Ω	0.1 Ω	
	$130.00	111,110 Ω	1 Ω	10k	1k	100 Ω	10 Ω	1 Ω	
	$140.00	1,111,100 Ω	10 Ω	100k	10k	1 k	100 Ω	10 Ω	
	$185.00	11,111,000 Ω	100 Ω	1 MEG	100k	10 k	1 k	100 Ω	
DB62	$140.00	11,111.1Ω	0.01Ω	1k	100Ω	10 Ω	1 Ω	0.1 Ω	0.01Ω
	$150.00	111,111 Ω	0.1 Ω	10k	1k	100 Ω	10 Ω	1 Ω	0.1 Ω
	$160.00	1,111,110 Ω	1 Ω	100k	10k	1 k	100 Ω	10 Ω	1 Ω
	$200.00	11,111,100 Ω	10 Ω	1 MEG	100k	10 k	1 k	100 Ω	10 Ω

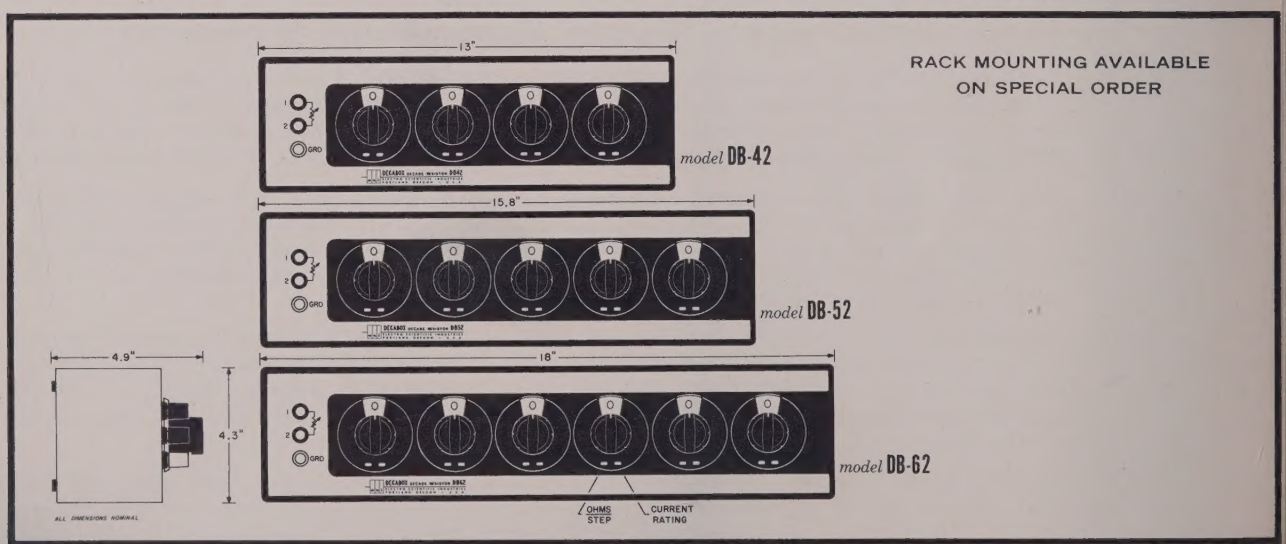
*F.O.B. PORTLAND, OREGON
*Quantity discounts

0 to 9 units	None
10 to 19 units	− 5%
20 to 99 units	−10%
100 units and over	−15%

CIRCUIT DIAGRAM



RESISTOR				CURRENT LIMITS				
1 MEG	100k	10k	1k	100Ω	10Ω	1Ω	0.1Ω	0.01Ω
0.3ma	2.3ma	7ma	23ma	71ma	230ma	710ma	1.6a	4a



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